

## CLAIMS

What is claimed as new and desired to be protected by Letters Patent of the United States is:

5           1.       An image processing apparatus which includes an image reading apparatus, comprising:

          a first memory storing optical positioning information of the image reading apparatus;

          a book image corrector configured to perform an image  
10       correction based on reference data from an image read by the image reading apparatus when the image is of a book document, the book image corrector comprising:

          a first corrector configured to correct in a main scanning direction a distortion of the image of the book  
15       document based on the reference data;

          a second corrector having a plurality of different correction modes configured to correct a distortion of the image of the book document in a sub-scanning direction; and

20       a selector configured to select one of the plurality of different correction modes of the second corrector based on the optical positioning information stored in the first memory.

25           2.       The image processing apparatus according to claim 1, wherein the reference data includes a page outline, a

ruled line, and a character line.

3. The image processing apparatus according to claim 1, wherein the book document is laid on the image reading apparatus such that a binding portion of the book document is parallel to the main scanning direction.

4. The image processing apparatus according to claim 1, wherein the plurality of different correction modes include a first mode which corrects a rising amount of an image portion of the image of the book document in a vicinity of the binding portion and a second mode which extracts a character circumscribing rectangle from the image of the book document and corrects the distortion based on a rectangle aspect ratio of the character circumscribing rectangle, and wherein the selector selects the first mode when the optical positioning information is stored in the first memory and the second mode when the optical positioning information is not stored in the first memory.

5. The image processing apparatus according to claim 1, further comprising a second memory storing a user selection mode, wherein the selector selects another one of the plurality of different correction modes which does not perform a distortion correction when the optical positioning information is not stored in the first memory.

6. The image processing apparatus according to claim 1, further comprising a second memory storing a user selection mode, wherein the selector selects a different one of the plurality of different correction modes which does not perform a correction of the distortion in the sub-scanning direction, regardless of whether the optical positioning information is stored in the first memory.

7. An image processing apparatus which includes an image reading apparatus, comprising:

an image designating mechanism configured to designate a type of image of book document from the image reading apparatus;

a reference data extractor configured to extract reference data obtained by the image of the book document;

a book image corrector configured to extract reference data from an image read by the image reading apparatus, to analyze the image, and to perform an image correction when the image is determined as an image of a book document according to an analysis result, the book image corrector comprising:

a first corrector configured to correct in a main scanning direction a distortion of the image of the book document based on the reference data extracted from the image of the book document; and

a second corrector having a plurality of different correction modes configured to correct a distortion of the image of the book document in a sub-scanning direction, and

5            wherein the reference data extractor extracts the reference data based on the type of image designated by the image designating mechanism.

8.        The image processing apparatus according to claim  
10        7, wherein the reference data includes a page outline, a ruled line, and a character line.

9.        The image processing apparatus according to claim  
15        7, wherein the book document is laid on the image reading apparatus such that a binding portion of the book document is parallel to the main scanning direction.

10.       The image processing apparatus according to claim  
20        7, wherein the reference data extractor extracts the ruled line and the character line other than the page outline as the reference data when the image designating mechanism designates a binary image.

11.       An image processing apparatus which includes an  
25        image reading apparatus reading a book document having a binding portion, comprising:

an image distortion corrector configured to perform a distortion correction of an image of a book document read by the image reading apparatus; and

an image adjustor configured to adjust an image of the book document after the process of the distortion correction is completed.

12. The image processing apparatus according to claim 11, wherein the book document is laid on the image reading apparatus such that a binding portion of the book document is parallel to the main scanning direction.

13. The image processing apparatus according to claim 12, wherein the image adjustor centrally aligns the binding portion of the book document to the image after the process of the distortion correction is completed.

14. The image processing apparatus according to claim 12, wherein the image adjustor equally adjusts a size of the corrected image to a size of the book document.

15. The image processing apparatus according to claim 12, wherein the image adjustor centrally aligns the binding portion of the corrected image and equally adjusts a size of an output image to the book document.

16. The image processing apparatus according to claim 11, further comprising an instructing mechanism which instructs an adjustment of a corrected image, wherein the image adjustor adjusts the image based on an instruction of the instructing mechanism.

17. An image processing apparatus which includes image reading means, comprising:

first memory means for storing optical positioning information of the image reading means;

correcting means for performing an image correction based on reference data from an image read by the image reading means when the image is of a book document, the book image corrector comprising:

first correcting means for correcting in a main scanning direction a distortion of the image of the book document based on the reference data;

second correcting means having a plurality of different correction modes for correcting a distortion of the image of the book document in a sub-scanning direction; and

selecting means for selecting one of the plurality of different correction modes of the second correcting means based on the optical positioning information stored in the first memory means.

18. The image processing apparatus according to claim

17, wherein the reference data includes a page outline, a ruled line, and a character line.

19. The image processing apparatus according to claim  
5 17, wherein the book document is laid on the image reading means such that a binding portion of the book document is parallel to the main scanning direction.

20. The image processing apparatus according to claim  
10 17, wherein the plurality of different correction modes include first mode means for correcting a rising amount of an image portion of the image of the book document in a vicinity of the binding portion and second mode means for extracting a character circumscribing rectangle from the image of the book  
15 document and correcting the distortion based on a rectangle aspect ratio of the character circumscribing rectangle, and wherein the selecting means selects the first mode means when the optical positioning information is stored in the first memory means and the second mode means when the optical  
20 positioning information is not stored in the first memory means.

21. The image processing apparatus according to claim  
17, further comprising second memory means for storing a user  
25 selection mode, wherein the selecting means selects another one of the plurality of different correction modes which does

not perform a distortion correction when the optical positioning information is not stored in the first memory means.

5           22.    The image processing apparatus according to claim 17, further comprising second memory means for storing a user selection mode, wherein the selecting means selects a different one of the plurality of different correction modes which does not perform a correction of the distortion in the  
10   sub-scanning direction, regardless of whether the optical positioning information is stored in the first memory means.

          23.    An image processing apparatus which includes image reading means, comprising:

15           image designating means for designating a type of image of book document from the image reading means;

          reference data extracting means for extracting reference data obtained by the image of the book document;

          book image correcting means for extracting reference  
20   data from an image read by the image reading means, analyzing the image, and performing an image correction when the image is determined as an image of a book document according to an analysis result, the book image correcting means further comprising:

25           first correcting means for correcting in a main scanning direction a distortion of the image of the book

document based on the reference data extracted from the image of the book document; and

second correcting means having a plurality of different correction modes for correcting a distortion of the image of the book document in a sub-scanning direction, and

wherein the reference data extracting means extracts the reference data based on the type of image designated by the image designating means.

24. The image processing apparatus according to claim 23, wherein the reference data includes a page outline, a ruled line, and a character line.

25. The image processing apparatus according to claim 23, wherein the book document is laid on the image reading means such that a binding portion of the book document is parallel to the main scanning direction.

26. The image processing apparatus according to claim 23, wherein the reference data extracting means extracts the ruled line and the character line other than the page outline as the reference data when the image designating means designates a binary image.

27. An image processing apparatus which includes an image reading means for reading a book document having a

binding portion, comprising:

image distortion correcting means for performing a distortion correction of an image of a book document read by the image reading means; and

5 image adjusting means for adjusting an image of the book document after the process of the distortion correction is completed.

28. The image processing apparatus according to claim  
10 27, wherein the book document is laid on the image reading means such that a binding portion of the book document is parallel to the main scanning direction.

29. The image processing apparatus according to claim  
15 28, wherein the image adjusting means centrally aligns the binding portion of the book document to the image after the process of the distortion correction is completed.

30. The image processing apparatus according to claim  
20 28, wherein the image adjusting means equally adjusts a size of the corrected image to a size of the book document.

31. The image processing apparatus according to claim  
25 28, wherein the image adjusting means centrally aligns the binding portion of the corrected image and equally adjusts a size of an output image to the book document.

32. The image processing apparatus according to claim 27, further comprising instructing means for instructing an adjustment of a corrected image, wherein the image adjusting means adjusts the image based on an instruction of the instructing means.

33. An image processing method, comprising the steps of:

10 storing optical positioning information of an image reading apparatus;  
reading an image of a book document;  
extracting reference data from an image read by the reading step;  
15 analyzing the image;  
selecting one of a plurality of different correction modes based on the optical positioning information stored in the storing step; and  
performing an image correction when the image is  
20 determined as an image of a book document according to an analysis result performed by the analyzing step, the performing step comprising the steps of:  
first correcting in a main scanning direction a distortion of the image of the book document based on the  
25 reference data extracted from the image of the book document;  
and

second correcting a distortion of the image of  
the book document in a sub-scanning direction.

34. The image processing method according to claim 33,  
5 wherein the reference data includes a page outline, a ruled  
line, and a character line.

35. The image processing method according to claim 33,  
wherein the book document is laid on the image reading  
10 apparatus such that a binding portion of the book document is  
parallel to the main scanning direction.

36. The image processing method according to claim 33,  
wherein the plurality of different correction modes include a  
15 first mode which corrects a rising amount of an image portion  
of the image of the book document in a vicinity of the  
binding portion and a second mode which extracts a character  
circumscribing rectangle from the image of the book document  
and corrects the distortion based on a rectangle aspect ratio  
20 of the character circumscribing rectangle, and wherein the  
selecting step selects the first mode when the optical  
positioning information is stored in the storing step and the  
second mode when the optical positioning information is not  
stored in the storing step.

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37. The image processing method according to claim 33,

further comprising a memorizing step of storing a user  
selection mode, wherein the selecting step selects another  
one of the plurality of different correction modes which does  
not perform a distortion correction when the optical  
5 positioning information is not stored in the storing step.

38. The image processing method according to claim 33,  
further comprising a memorizing step of storing a user  
selection mode, wherein the selecting step selects a  
10 different one of the plurality of different correction modes  
which does not perform a correction of the distortion in the  
sub-scanning direction, regardless of whether the optical  
positioning information is stored in the storing step.

15 39. An image processing method, comprising the steps  
of:

designating a type of image of book document from an  
image reading apparatus;

reading an image of the book document;

20 extracting reference data obtained by the image of the  
book document;

selecting one of a plurality of different correction  
modes based on the optical positioning information stored in  
the storing step; and

25 performing an image correction when the image is of a  
book document, said performing comprising the steps of:

first correcting in a main scanning direction a distortion of the image of the book document based on the reference data extracted from the image of the book document;

second correcting a distortion of the image of the book document in a sub-scanning direction; and

wherein the extracting step extracts the reference data based on the type of image designated by the designating step.

40. The image processing method according to claim 39, wherein the reference data includes a page outline, a ruled line, and a character line.

41. The image processing method according to claim 39, wherein the book document is laid on the image reading apparatus such that a binding portion of the book document is parallel to the main scanning direction.

42. The image processing method according to claim 39, wherein the extracting step extracts the ruled line and the character line other than the page outline as the reference data when the image designating mechanism designates a binary image.

43. An image processing method, comprising the steps of:  
performing a distortion correction of an image of a

book document read by an image reading apparatus; and  
adjusting an image of the book document after the  
process of the distortion correction is completed.

5           44. The image processing method according to claim 43,  
wherein the book document is laid on the image reading  
apparatus such that a binding portion of the book document is  
parallel to the main scanning direction.

10           45. The image processing method according to claim 44,  
wherein the adjusting step centrally aligns the binding  
portion of the book document to the image after the process  
of the distortion correction is completed.

15           46. The image processing method according to claim 44,  
wherein the adjusting step equally adjusts a size of the  
corrected image to a size of the book document.

20           47. The image processing method according to claim 44,  
wherein the adjusting step centrally aligns the binding  
portion of the corrected image and equally adjusts a size of  
an output image to the book document.

25           48. The image processing method according to claim 43,  
further comprising an instructing step of instructing an  
adjustment of a corrected image, wherein the adjusting step

adjusts the image based on an instruction of the instructing step.

49. A program of an image correction causing a  
5 computer to execute an image correction according to a method,  
comprising the steps of:

storing optical positioning information of an image  
reading apparatus;

reading an image of a book document;

10 extracting reference data from an image read by the  
reading step;

analyzing the image;

selecting one of a plurality of different correction  
modes based on the optical positioning information stored in  
15 the storing step; and

performing an image correction when the image is  
determined as an image of a book document according to an  
analysis result performed by the analyzing step, the  
performing step comprising the steps of:

20 first correcting in a main scanning direction a  
distortion of the image of the book document based on the  
reference data extracted from the image of the book document;  
and

second correcting a distortion of the image of  
25 the book document in a sub-scanning direction.

50. A computer readable medium storing a program of  
5 an image correction causing a computer to execute an image  
correction according to a method according to any one of  
claims 33 to 48.